

# CHAPTER 3

## Resource Analysis

This 2005–2006 Kissimmee Basin Plan Update provides an overview of supply sources, (KB Plan Update) describes ongoing modeling efforts and studies; and, identifies resource protection mechanisms, which meet the 1-in-10 year level of certainty standard required by state law.

### OVERVIEW OF SUPPLY SOURCES

#### Surficial Aquifer System

The Surficial Aquifer System (SAS) in the northern Kissimmee Basin is low yielding. Moreover, the quality of water in this aquifer system is poor. Additional constraints on use of this source include the fact that this system interacts with natural features such as isolated wetlands, baseflows to slough systems, and potentially with lake systems. The SAS, therefore, has limited potential to satisfy large-scale demands. However, one of the major functions of the SAS is to provide recharge to the Floridan Aquifer System (FAS), particularly in the western portion of the Northern Kissimmee Basin. However, this function does not occur in the eastern half of the Northern Basin, where the SAS is hydrologically isolated from the FAS due to the occurrence of low permeable clays and sediments within the Hawthorne Group. Thus, withdrawals within the FAS do not readily affect surficial features, such as lakes and wetlands, unless a connection exists.

#### Floridan Aquifer System

The FAS is a high yielding aquifer which provides substantial volumes of good quality water to a wide variety of use classes within Central Florida. The FAS is currently the sole source of potable quality water within the northern Kissimmee Basin. The FAS also currently provides the majority of supply for human demands occurring within central Florida. [ @ Insert discussion on the presence of salt water front on the east and the limitation it presents on availability.] The FAS also meets important environmental needs.

The FAS is confined throughout much of central Florida. In areas immediately north and east of the SFWMD's boundaries, the confined pressures within the aquifer are sufficient to cause the aquifer levels to exceed land surfaces. Within the SJRWMD, these conditions manifest themselves as free-flowing springs. The FAS is confined by the Hawthorne Group. These confining beds thin and become discontinuous in the western portion of the northern basin where the SAS provides recharge to the FAS. Also, there

are wetland systems and lake systems that have a high degree of connection to the Floridan Aquifer. In these regions, withdrawals from the FAS have the potential to impact natural systems. Thus, the FAS also interacts with environmental features.

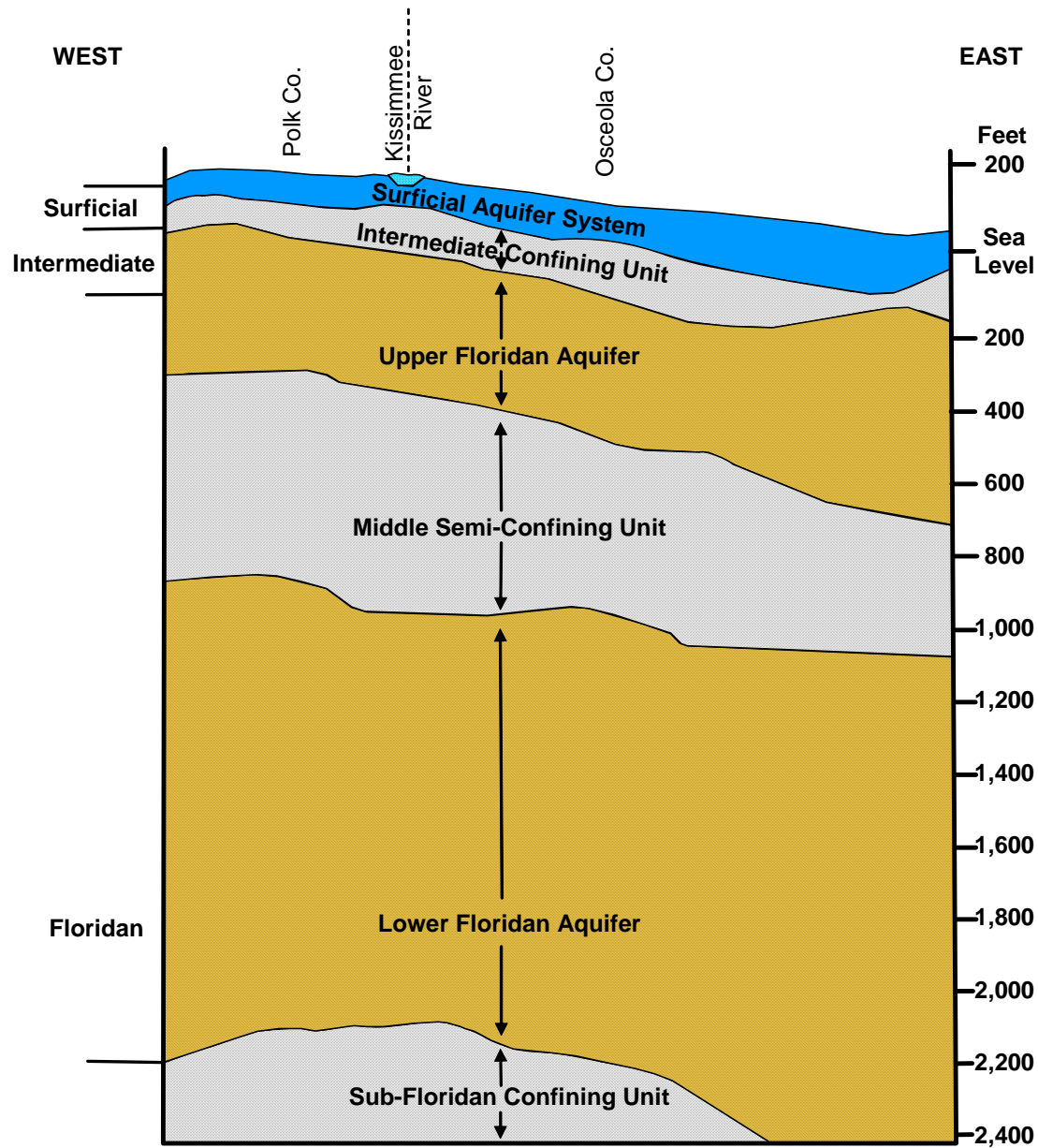
One method of offsetting the effects of withdrawals on environmental features is to provide increased recharge to the FAS. One area where this occurs is in the western portion of this basin. One method for this recharge to occur is rapid infiltration basins (RIBs). These RIBs provide treated wastewater recharge to the SAS and FAS. Studies have documented that recharge of the SAS has resulted in raising groundwater levels within the FAS as a result of this recharge phenomenon. Opportunities exist within this area to expand this use recharge concept. Utilization of this recharge concept also provides the benefit of minimizing impacts to wetlands. Conversely, withdrawals from the FAS in areas where withdrawals exceed recharge capacity of the Surficial Aquifer can lower levels within the SAS within the area where lakes and wetlands occur and have the potential to cause harm to environmental resources including lakes, springs, and wetland hydropatterns

Over the years, concentrated withdrawals by users within all three water management districts in central Florida have resulted in declining groundwater elevations within the FAS in a broad area within the region. These declines are occurring as a result of rapid growth and the associated increase in use of the FAS in central Florida. Declines in water levels within the FAS have the potential to impact environmental features in these areas including springs, wetlands and lakes. Moreover, declines in the FAS have the potential to cause movement of the saltwater front located in the eastern portion of the northern Kissimmee Basin.

## WATER RESOURCES

The hydrogeology of the Kissimmee Basin consists of three major hydrogeologic units: the Surficial Aquifer System (SAS), the intermediate confining unit and the Floridan Aquifer System (FAS) as shown in **Figure 1**. The region's water quality deteriorates, becoming more brackish, as it moves south and east. Chapter 6 of the *Consolidated Water Supply Plan Support Document* (on the enclosed CD) discusses the aquifer systems, hydrogeologic units and aquifer yields for this region in greater detail.

This discussion of the Kissimmee Basin Planning Area's water resources distinguishes between its northern and southern regions. The northern basin is primarily influenced by urban driven demands, while the southern basin is agriculture demand driven. The northern basin consists of those entities that contribute to the groundwater depression occurring in the Upper Floridan Aquifer in central Florida, including sections of Orange, Osceola and Polk counties located in the SFWMD's jurisdiction. The southern basin generally refers to areas south of Lake Kissimmee, including Okeechobee, Highlands and Glades counties.



**Figure 1.** Generalized Geologic Cross-Section of the Kissimmee Basin Planning Area.

Traditional sources of water for the northern basin are the upper and lower portions of the Floridan Aquifer System (FAS). Water quality in the FAS is generally very good, but concentrations of chloride and total dissolved solids increase in eastern Orange and Osceola counties. The Surficial Aquifer System (SAS) is not a viable alternative water source due to low production rates and poor water quality. In the western sections of the planning region and into Polk County, the water quality and productivity of the Lower Floridan Aquifer System deteriorates.

Surface water from Lake Istokpoga and Lake Okeechobee are traditional water sources for Okeechobee, Glades and Highlands counties in the southern portion of the

planning region. While groundwater from the Upper Floridan Aquifer System is available for use, water quality deteriorates closer to Lake Okeechobee. In addition, the Lower Floridan Aquifer is comprised of saline water throughout the southern basin, with exceptions in the northwestern portion of Highlands County.

## **NORTHERN KISSIMMEE BASIN ASSESSMENT.**

### **Spring Discharge Evaluation**

Although there are no natural springs located within the Kissimmee Basin, several environmentally critical springs are located just outside of the SFWMD's boundary, in the Wekiva Basin in northern Orange County. These springs contribute to the base flow of the Wekiva River and several of its tributaries. The St. Johns River Water Management District has established minimum flow values for eight Wekiva Basin springs. Estimated spring flow requirements are based, in part, upon environmental demands of Wekiva River and its tributaries.

### **Lake Wales Ridge Lake Level Evaluation**

The Southwest Florida Water Management District has determined several lakes located along the Lake Wales Ridge are stressed. These lakes lie west of the KB Planning Area, within a Water Resource Caution Area in the Southwest Florida Water Management District jurisdiction. Lake level protection criteria were identified to address the SWFWMD's concerns over declining lake levels in 2000. This criteria remains unchanged as of 2006.

The SWFWMD recently established MFL's for eight lakes along the Lake Wales Ridge extending from Polk County to Highlands County. Additionally, the SWFWMD established a set of Floridan Aquifer monitoring wells to assist assessment of potentially adverse aquifer levels threatening the lakes.

## **SOUTHERN KISSIMMEE BASIN ASSESSMENT**

A new, upgraded groundwater model was created replacing the Glades, Okeechobee and Highlands model developed for use in conjunction with the 2000 KB Plan. The Lower Kissimmee Basin (LKB) Groundwater Model includes all of Okeechobee and Highlands counties and most of Glades County. It also includes portions of Polk, Osceola, Indian River, St Lucie, Martin, Palm Beach, Charlotte, DeSoto and Hardee counties.

The LKB Groundwater Model is a four-layer, steady-state MODFLOW model. The new model revisits the aquifer structure in the area as a result of the recent investigations conducted in south Florida. The model will be used to evaluate the effects

of projected increases in groundwater withdrawals from the Upper and Middle Floridan aquifers.

Water demands for uses within the SFWMD portions of Glades, Okeechobee and Highlands counties is projected to show only minimal increase before 2025. Modeling simulations of projected groundwater withdrawals within these counties show only minor changes in the Floridan Aquifer levels. For the purpose of this analysis, groundwater demands for the SFWMD were kept at their 1995 withdrawal rate consistent with efforts by the SFWMD to limit further net use of Floridan Aquifer. Increases in withdrawals were modeled within the SFWMD. Demands outside the District were not included in this modeling effort. Interpretation of the results from this base model simulation do not suggest concerns with future increases in groundwater use in the model domain through 2025 for lakes located along the Lake Wales Ridge portion within Highlands County.

The Heartland Water Alliance (HWA)—representing Highlands, Desoto, Hardee and Polk Counties have identified several possible wells for location within the SFWMD that would be used to meet water demands within the SFWMD. The proposed wells would deliver an estimated 9 million gallons of water per day. While these wells are recognized for potential use, the use of these wells were not included within the KB planning demands, but should be recognized as potentially impacting use of groundwater within the SFWMD.

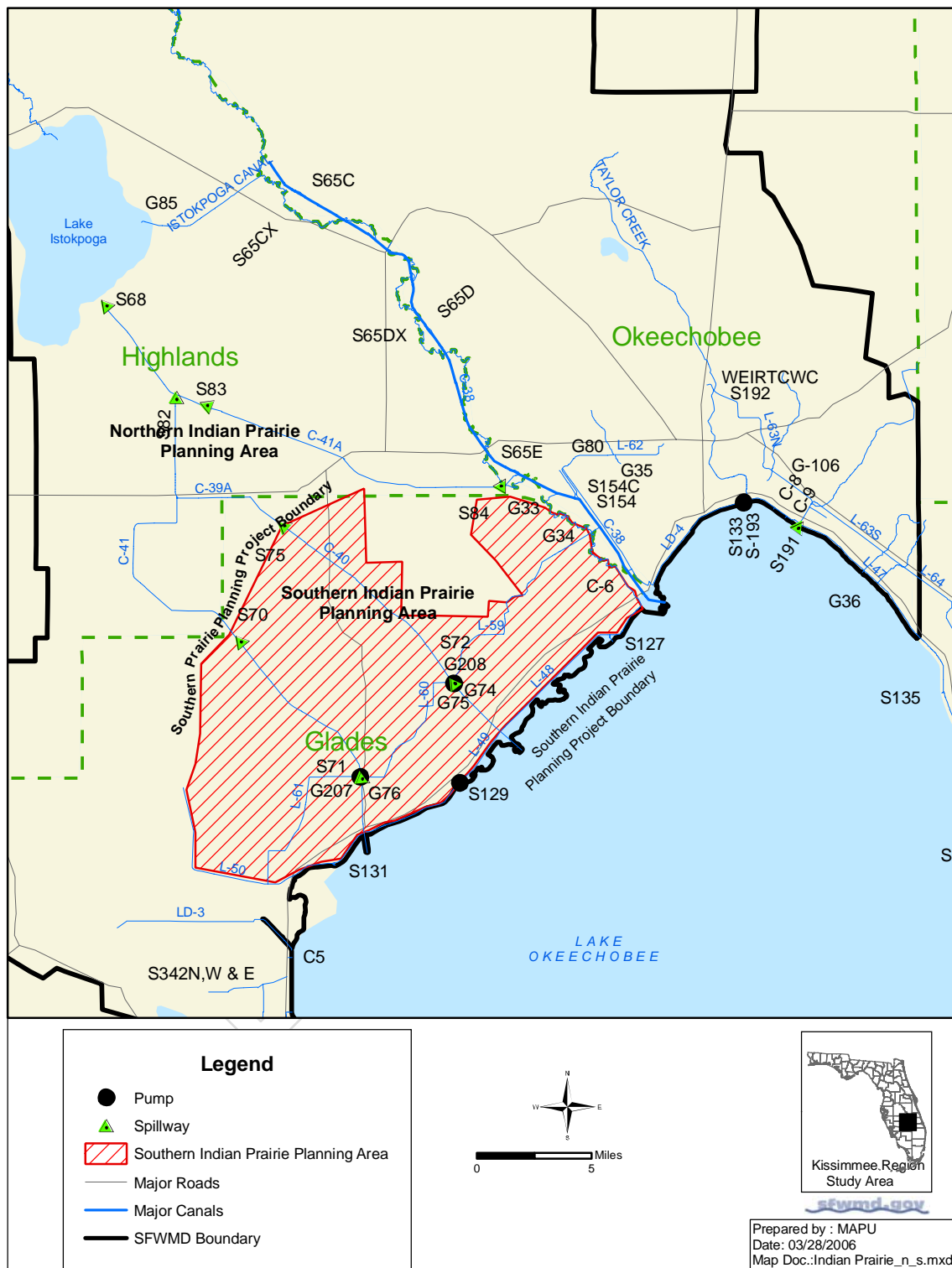
## Lake Istokpoga–Indian Prairie Basin Analysis

The Lake Istokpoga–Indian Prairie Basin is defined as those areas with access to the C-40, C-41, C-41A canals on Lake Istokpoga, either directly or via other canals. **Figure 2** shows the features of the Indian Prairie Basin. The District’s regulatory program, supported by earlier evaluations and historic operations, established a level of water use from Lake Istokpoga to where sufficient supplies were available to meet the then current demands. As a result, new uses of surface water in the Lake Istokpoga–Indian Prairie Basin have been restricted.

As documented in the 2000 KB Plan, an evaluation of water use deliveries from Lake Istokpoga to the Indian Prairie Basin showed projected surface water demands for 2020 could potentially be met by a combination of water resources. Proposed water supply solutions included increased water releases from Lake Istokpoga, reduction or removal of required releases for canal maintenance and back pumping of water from Lake Okeechobee via the G-207 and G-208 surface water pumps.

The 2000 KB Plan recommended development of an operational plan for Lake Istokpoga and Lake Okeechobee to manage water deliveries to the Indian Prairie Basin from these two sources.

Proposed changes to the Lake Okeechobee regulation schedule and issues related to the Herbert Hoover Dike have created uncertainty concerning water availability for new demands.



**Figure 2.** Lake Istokpoga–Southern Indian Prairie Planning Area.

## OTHER RELATED STUDIES AND PROJECTS

### Kissimmee Chain of Lakes Long Term Management Plan

The Kissimmee Chain of Lakes Long-Term Management Plan was initiated in April 2003 by the SFWMD Governing Board to work with the U.S. Army Corps of Engineers (USACE) and stakeholders to develop a long-term management plan for the Kissimmee Chain of Lakes. The intent of this plan is to improve, enhance and/or sustain lake ecosystem health while balancing impacts to the Kissimmee River and downstream ecosystems, such as Lake Okeechobee.

The proposed scope of the Kissimmee Chain of Lakes Long-Term Management Plan was based on water resources issues in the Upper Kissimmee Basin. After identifying these issues and current initiatives, the partner agencies identified goals to address concerns aligned with the District mission as defined by the SFWMD resolution. Among these goals are: hydrologic management; habitat preservation and enhancement; aquatic plan management; water quality improvement; water supply and recreation and public use (SFWMD *et al.* 2004).

This modeling and public review process is currently underway. Recommendations for modifying operational schedules for the structures located in the upper basin are planned for submission to the Army Corps by the end of 2007. Considered in these recommendations will be a balancing of all the environmental, flood control and water supply expectations on the system.

### Lake Okeechobee and Estuary Recovery

The Lake Okeechobee and Estuary Recovery (LOER) Plan has been developed to improve water quality, expand water storage, facilitate land acquisition and enhance the ecologic health of Lake Okeechobee and St. Lucie and Caloosahatchee estuaries. The LOER Plan includes five “Fast-Track” construction projects and numerous interagency initiatives to provide short-term relief and long-term protection. Planned construction projects in or adjacent to the KB Planning Area include the Taylor Creek Reservoir and Nubbin Slough Stormwater Treatment Area (STA) Expansion and Lakeside Ranch STA. The LOER Plan involves the continued implementation of the Lake Okeechobee Protection Program (LOPP) and the CERP Lake Okeechobee Watershed Project (LOWP).



Governor Jeb Bush unveils LOER Program

The U.S. Army Corps of Engineers is expediting modifications to the Lake Okeechobee regulation schedule and the SFWMD is developing rules to modify its water shortage plans. The Critical Project Pilot STAs at Nubbin Slough and Taylor Creek are complete. Although these projects are water quality improvement projects, and not for water supply, they impact the timing of water availability from water sources close to these projects.

Additionally, in April 2006, an engineering study assessing the condition of the Herbert Hoover Dike around Lake Okeechobee was completed for the District. The study's findings included an opinion that the dike does not meet current dam safety standards, and that internal erosion caused by seepage through the earthen structures is affecting the dike. High lake levels are believed to significantly increase this internal erosion. Recommendations for addressing these conditions include fast-tracking repairs to the dike by the U.S. Army Corps of Engineers, and lowering lake levels to minimize seepage. Although lowered lake levels have the potential to improve water quality and habitat conditions in the lake, they also reduce the water supply available from the lake for agriculture and public supply.

The SFWMD is responsible for implementing the statutory provisions in Section 373.042 (1), F.S., requiring the establishment of minimum flows and levels (MFLs) for surface waters and aquifers. The minimum flow is defined at the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The minimum level is defined as the limit at which further withdrawals would be significantly harmful to the resources of the area.

Section 40E-8.021 (24), F.A.C., defines *significant harm* to be the temporary loss of water resource functions that takes more than two years to recover.

Section 373.0421, F.S., further requires that once the MFL technical criteria have been established, the District must develop and expeditiously implement a recovery and prevention strategy for those water bodies that are currently exceeding, or are expected to exceed, the MFL criteria.

Chapter 40E-8, F.A.C., (SFWMD) and Chapter 40C-8 (SJRWMD) contain the MFLs and criteria for specific water bodies and aquifers within the respective Districts and also include the recovery and prevention strategies for each MFL. Additional MFL protection is identified in Chapter 40E-2, F.A.C., as consumptive use permitting criteria for MFLs, and in Chapters 40E-21 and 40E-22, F.A.C., as water shortage criteria for MFLs.

## REFERENCES CITED

- South Florida Water Management District. 2003. *Basis of Review for Water Use Permit Applications within the South Florida Water Management District*. Environmental Resource Regulation Department, SFWMD, West Palm Beach, FL. vari. pag.
- South Florida Water Management District, *et al.* 2004. *Kissimmee Chain of Lakes Long-Term Management Plan*. SFWMD, West Palm Beach, FL. vari. pag.